

and even to fire on the riotous crowd. As for the negroes, whom the United States have always with them, he suggests only the need for training in the simpler arts and handicrafts; for a literary education, in his judgment, they are still wholly unfit.

PRACTICAL ORGANIC CHEMISTRY.

A Systematic Course of Practical Organic Chemistry.

By Lionel Guy Radcliffe, with the assistance of Frank Sturdy Sinnatt. Pp. xi+264. (London: Longmans, Green and Co., 1905.) Price 4s. 6d.

THIS book is intended mainly for students of elementary organic chemistry. The students are supposed to work about five hours per week, and, consequently, experiments which take a longer time, and must be finished without interruption, are omitted.

The exercises include a variety of important reactions and involve work with many of the more common compounds and reagents in organic chemistry. There is a set of exercises on the fatty compounds, and another on benzene; these include instructions in the observation of melting point and boiling point, in the determination of specific gravity, of the equivalent of an acid, and of sugar by the use of Fehling's solution.

This course worked through, there is a higher course, including the preparation of such substances as anisol, benzyl chloride, and benzaldehyde, the determination of equivalents and molecular weights, and of carbon, hydrogen, nitrogen, &c.

More care might have been spent on the finish of the book. The punctuation has been neglected; e.g. "recrystallise until the m.p.'s do not change" (p. 16), and "recrystallise the hydrobenzamide, formed from hot alcohol" (p. 110). The diction is not what it ought to be. "Heated alone succinic acid sublimates" (p. 196). "See if the example obtained [of methyl orange] is sensitive to acids" (p. 96).

The instructions for experiments are fairly detailed and generally good. Certain mistakes have been made. The student is repeatedly directed, after having dried a preparation by calcium chloride, to distil it in presence of the drying agent (e.g. pp. 54, 176). If a dry distillate is desired, the distillation should be carried out after removing the calcium chloride. Again, in determining molecular weight by Victor Meyer's method, the volume and temperature of the expelled gas may surely be read without waiting so long as an hour (p. 120). Is a minute not long enough?

Under protest, the authors give a section on the qualitative analysis of organic mixtures, "for the sake of students who are taking certain examinations." "The authors are quite sensible of the fact that the analysis of such mixtures cannot be regarded as useful practical organic chemistry" (p. 172). Surely this is an impatient verdict. Qualitative analysis is a valuable training in so far as the student is led to bring book knowledge to bear on work in the laboratory, and is prevented from taking suspicion for proof. The teacher should re-

quire him, in every case, to produce a specimen (or a derivative) of each constituent of the mixture. With this stipulation, knowledge, resource and judgment are needed in organic qualitative analysis even more than in inorganic. How many different ways are available for the separation of organic substances from one another:—precipitation, the use of different solvents, ordinary and steam distillation, extraction by ether from acid and alkaline solution, hydrolysis, oxidation, &c.! Surely time spent in mastering these methods of analysis is not wasted. A. N. M.

OUR BOOK SHELF.

Die Entwicklung der electrischen Messungen. By Dr. O. Frölich. Pp. xii+192; 124 illustrations. (Brunswick: Vieweg and Son, 1905.) Price 6 marks.

THIS is the fifth of a series of scientific monographs published under the general heading *Die Wissenschaft*. It consists of an historical sketch of the development of physical measurements, especially of those connected with electrotechnics. It must be admitted that in this go-ahead age the technical man finds little time to make a retrospect of his subject; he is too much concerned with its developed aspect. Even in colleges and schools, as the publisher states, the historical side of the subject is too much neglected. The present volume is intended to remove this reproach.

To give an idea of the book, we will outline here the first chapter (on current measurement). In its first section it deals with the first galvanometer, starting with the work of Oersted and Schweigger on the action of a current on a magnetic needle. Then follow the fundamental laws of constant currents as developed by Ohm, Ampère, Biot-Savart, and the methods of demonstrating them. The astatic needles of Nobili and Davy and the measurements of Faraday are next described, and this section concludes with the methods devised for calibrating the early types of galvanometer.

The second section is called the mirror galvanometer. It describes the work of Gauss and Weber on absolute measurements, the first telegraph of Gauss and Weber (1833), and the Atlantic cable furnished with mirror galvanometers by Lord Kelvin (1858). The remainder of the section deals with improvements effected in the control of the moving system (damping, &c.), and describes the galvanometers of Wiedemann, Siemens, and Kelvin, and the more recent variants of du Bois and Rubens, Paschen, Hartman and Braun, d'Arsonval, Edelmann, and Siemens and Halske.

When it is mentioned that all this is included in thirty pages it will be realised that the descriptions are exceedingly brief. The general impression conveyed is that for a book of this kind to be of much use, fuller treatment is necessary. Still, it will serve to direct attention to the general trend of advance, and to indicate the names of those that share the chief honour of it. Its value would be considerably increased by a larger number of references to original sources of information. These are given sometimes only.

Zoologischer Jahresbericht für 1904. Edited by Prof. P. Mayer. (Berlin: Friedländer and Son, 1905.)

THE zoological station at Naples, for which this bulky volume, like its predecessors, is published, is to be congratulated on the early date of its issue and the thoroughness with which the various contributors

have done their work. In issuing a register of zoological work for 1904 so early as September of the present year, the editor and publisher have indeed beaten our own "Zoological Record"; but it must be remembered that in the present volume is included a considerable amount of literature belonging to earlier years, while it is difficult to believe that the whole of the papers for 1904 can be included.

It might be imagined, for those not conversant with the two works, that the "Zoologischer Jahresbericht" is a serious rival to the "Zoological Record," and that the publication of the one renders that of the other superfluous. As a matter of fact, this is not the case; for, in the first place, it is highly desirable that a record of zoological literature should be published in English, and, in the second, the two publications do not cover the same ground. The "Zoological Record," for instance, is specially devoted to the systematic aspect of the subject, particular pains being taken to include the names of all new species and subspecies. In the Continental work, on the other hand, systematic work is rigorously excluded, and attention concentrated on the bionomical, anatomical, and physiological aspects of the subject. The two records are therefore to a considerable extent supplemental and complementary to one another, more especially as in the one before us a somewhat full *précis* of the main subjects of the more important papers forms an important feature. The practice of including all the papers on Vertebrata under a single heading does not, indeed, appeal to us; but then, it is true, this is in some degree compensated by dividing the summary of their contents into their respective class-positions. So far as we have been able to judge, the quotations of the titles of the papers and the references to their places of publication are singularly free from error, and the volume, like its predecessors, cannot fail to be of the highest value to all workers in morphological and anatomical zoology.

R. L.

Examples in Arithmetic. By C. O. Tuckey. Pp. xii+241+xxxix. (London: George Bell and Sons, 1905.) Price 3s.

The Primary Arithmetic. Parts i. and ii. Edited by Dr. Wm. Briggs. Pp. 80 and 94. (London: The University Tutorial Press.) Price 6d. each.

THESE books are intended for the use of teachers who instruct their classes orally in the processes and rules of arithmetic, and who only require the assistance of graduated sets of exercises. In the work by Mr. Tuckey the course is fairly complete, embracing the usual commercial arithmetic, with a chapter on the application of proportion to problems in geometry and physics, and a section devoted to numerical computations by the aid of compound interest, logarithmic and trigonometrical tables, in which a little elementary trigonometry is introduced. There are examples on graphs and squared paper work, and the users of the book will have an abundant choice of exercises of modern type.

"The Primary Arithmetic" will be complete in three parts. The first part gives sets of exercises on the four simple rules and on the compound rules for money. The examples increase in difficulty by almost imperceptible stages, beginning with those of the simplest kind, and they are suitable for very young scholars. Part ii. completes the compound rules for weights and measures, including the metric system. Then follow exercises on vulgar fractions and on practice and invoices. In these two parts, as well as in the book by Mr. Tuckey, the answers to the exercises occupy a considerable space at the end of each volume.

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LETTERS TO THE EDITOR.

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A Magnetic Survey of Japan.

IN NATURE of April 20 (vol. lxxi. p. 578), Prof. A. Schuster has given a comprehensive review of the magnetic survey of Japan with a friendly criticism. The responsibility of its writer may be a sufficient excuse for the following remarks partly in way of reply.

Prof. Schuster directs attention to the small space given to the description of the working of the instruments. This arises from the fact that these instruments were essentially the same as the one used in the previous survey of 1887, and described in vol. ii., pp. 178-193, of the *Journal of the College of Science*, Imperial University, Tokyo, to which the reader is referred for details. A few improvements that have since been made are mentioned in the present report, pp. 7-8.

We are glad to see that the methods adopted for calculating the corrections for heights of stations and the way of disposing with the vertical current met his approval; only Prof. Schuster seems to attribute these currents to uncertainties in the observations, whereas we infer that they are as much, if not more, due to the inadequacy of the empirical formulæ, from the fact that they vanish near the middle of the several countries treated (p. 125).

Perhaps the more important point is with regard to the question of the seat of action. To avoid confusion, it might be well to remark that the word potential is used in different senses by different writers; some use it to denote a function which satisfies the Laplacian equation $\nabla^2 V = 0$, and others to denote the line integral of any irrotationally distributed vector, whether the solenoidal condition be satisfied or not. It is in the latter general sense that the word is used in the report.

Now Gauss's method of separating internal and external sources of action is based upon the assumption that these sources are entirely separated from each other by a free space; in other words, the Laplacian equation holds strictly over a finite portion of the space surrounding the earth surface. This is very plausible when we consider the earth as a magnetised body, as appears *a posteriori*. But when we abandon the restriction of the solenoidal distribution the method is no more applicable, and the observation of force over a spherical surface is not sufficient to settle the seat of action, although it may be explicable in harmonic form if its distribution is continuous, so that the Gaussian expansion must be taken in "Gauss's sense" (end of first paragraph, p. 140 of the report).

The possibility of the distribution of magnetism in the space surrounding the earth surface might appear quite extravagant, and may be included amongst what Gauss calls "baldenlose Phantasien," so long as we are considering the main causes of the terrestrial magnetism; but when we come to discuss the external causes and the horizontal atmospheric current the effects of which amount to only a small fraction of the observed forces, our assumption of the distribution being thoroughly solenoidal would seem subject to doubt, or at least to require observational evidence, so that "strictly speaking, the mode of distribution must remain perfectly arbitrary so long as we adhere solely to the observed elements" of magnetic forces on a spherical surface, when no further assumption than the Newtonian law of action is admitted.

It may not be unnecessary to add here that the search for the seat of action from observations of force over a surface is an inverse problem, and includes any arbitrary distribution of magnetism the resultant effect of which vanishes on that particular surface; we can put any system of magnets or electric circuits outside the surface, provided we envelop that surface with a counteracting shell or shells over which a proper distribution of magnetism is made according to Green's method of finding the density of induced electricity on a conductor, besides any